not having exceeded an hour, whilst in the latter it has exceeded many hours.

2. That the vitality of the ova was as well preserved in air saturated with moisture, as it would have been had they been in water.

3. That the ova may be included in ice without loss of vitality, provided the temperature is not so low as to freeze them.

4. That the ova, and also the fry recently produced, can bear for some time a temperature of about 80° or 82° in water, without materially suffering; but not without loss of life, if raised above 84° or 85°.

5. That the ova and young fry are speedily killed by a solution of common salt nearly of the specific gravity of sea-water, viz. 1026; and also by a weaker solution of specific gravity 1016.

Finally, in reference to the inquiry regarding the distribution of the species of fishes, he expresses his belief that some of the results may be of useful application, especially those given in the second and third sections; inferring, that as in moist air, the vitality of the ova is capable of being long sustained, they may during rain or fog be conveyed from one river or lake to another adhering to some part of an animal, such as a Heron or Otter, and also during a time of snow or frost; and, further, that other of the results may be useful towards determining the fittest age of ova for transport for the purpose of stocking rivers, and likewise as a help to explain the habitats, and some of the habits of the migratory species.

III. "Observations on the Anatomy and Affinities of the *Phyllirrhoë bucephala* (Peron)." By JOHN DENIS MACDONALD, Esq., R.N., Assistant-Surgeon of H.M.S.V. 'Torch.' Communicated by Sir W. BURNETT, K.C.B. Received March 30, 1855.

As the true position of Peron's genus *Phyllirrhoë*, and even the very existence of the animals composing it, have been matters of doubt to zoologists, during a late cruise to the Fiji Islands I determined to ply the towing-net with a little more diligence than usual, hoping to obtain a few of these almost hypothetical beings, and was rewarded by the capture of many specimens.

Some were taken in the neighbourhood of Lord Howe's Island, S. lat. 31° 31″, E. long. 159° 5″, some near Norfolk Island, S. lat. 29° 2″, E. long. 168° 2″, and others, although in smaller numbers, in different parts of our track. They generally made their appearance after dusk in the evening, and presented a great diversity in size, form and other external characters, which is due to changes in the muscular system, a variable amount of pigment spots, &c. Indeed at first I fully believed that several distinct species had been brought up together, but this idea was abandoned when I observed the most dissimilar forms gradually assume so close a resemblance to each other, as ultimately to render it difficult to distinguish them.

From these facts I am much inclined to think that the three species described by Quoy and Gaimard, viz. *P. amboinensis*. *P. punctulata* and *P. rubra*, *P. Lichtensteinii* (*Eurydice Lichtensteinii* of Eschscholtz) and *P. rosea* of D'Orbigny, are all referable to Peron's original species *P. bucephala*.

The body of *Phyllirrhoë* is elongated in form and compressed laterally, presenting for description an anterior and posterior extremity, a right and left surface, and a dorsal and ventral border. The head is surmounted by two lengthy, somewhat flattened and acuminate tentacula; the eyes lie beneath the skin, not being visible externally, and the mouth is in the form of a short truncated proboscis, with a vertical opening. The oval-shaped body is on an average about one inch and a half in length, which is something over twice the measurement from the dorsal to the ventral border taken at the middle or broadest part. The tail is quadrilateral in figure, gradually widening towards its posterior border, which is exceedingly thin. The outer integument is perfectly transparent and lined by muscular bundles, disposed longitudinally, and somewhat more than their own breadth apart. These communicate with one another by oblique branching slips, which thus form a kind of network enclosing long lozenge-shaped spaces. Here and there nerve-trunks of considerable size accompany the longitudinal bundles, dividing off into smaller twigs, which distribute themselves at pretty equal distances in a direction more or less perpendicular to that of the muscular fibres. Scattered about at irregular intervals amongst these structures are numerous reddish-brown pigment-spots, in the centre of each of which a clear vesicle is generally distinguishable. As above

alluded to, the actual tint of this pigment, and the relative number of spots deposited within a certain space, determine both the general quality and the depth of colour which are found to vary so much in different specimens of *Phyllirrhoë*.

The alimentary canal of this creature consists of a muscular tube lined with mucous membrane, extending without flexure from the mouth to the vent. It commences anteriorly in an oral dilatation, in connexion with which we notice a pair of lateral horny jaws articulated with each other superiorly, and beset with very minute and sharp-pointed teeth along the cutting edge, altogether much resembling those of *Glaucus*, and a lingual ribbon gradually increasing in diameter from before backwards, and supporting a pavement of long, conical, flattened and gracefully curved teeth with fine denticulations at the base. The central series of plates being symmetrical, the large tooth in each takes up a middle position, but in the lateral plates it inclines to the inner side. In some examples I have observed certain lobulated bodies lying in contact with the buccal mass, and which I am disposed to regard as salivary glands. The œsophagus is short, and suddenly expands into a moderately large stomach; and the latter, having received the biliary ducts near its posterior extremity, is continued into the rectum, which passes directly backwards some little distance, and ends in the anus, on the right side of the body, at the union of its posterior and middle thirds. The liver in *Phyllirrhoë* consists of four elongated, tubular, and sacculated portions or lobes, disposed along the borders of the body, two lying above and two below the alimentary canal. Each of the superior hepatic glands opens by a distinct duct into the supero-posterior part of the stomach, while the ducts of the inferior ones unite to form a common tube joining it at its infero-posterior part. The opposite or cæcal extremities of the two anterior hepatic lobes end in the neighbourhood of the head, while those of the others extend to within a short distance of the tail. The secreting cells of these organs are of a rounded or polyhedral form, containing, besides the nucleus, a reddish-brown pigment and fatty globules.

Phyllirrhoë possesses a simple systemic heart, consisting of a single auricle and ventricle. This organ lies upon the stomach, between the ducts of the two superior biliary glands; and a large vessel or sinus, with many circular constrictions in its walls, may be traced

towards the auricle, bringing back the aërated blood from the hinder extremity of the body. There are no visible respiratory organs, but it is probable that the cutaneous surface permits of the necessary exposure of the blood to the air contained in the surrounding medium.

The nervous system is well developed. The supra- and subœsophageal ganglia, with their commissural chords, form a close ring round the gullet immediately behind the buccal mass. The auditory sacs, which are filled with vibratory otokonia, appear to lie between both sets of ganglia, and the rudimentary visual organs, consisting each of a simple cell containing a refracting globule imbedded in black pigment, are also in contact with the nervous matter. Besides the actual distribution of the nerves given off from the cephalic ganglia, I noticed nodules of neurine lying at the base of the tentacula, communicating by commissural threads, and sending off each a principal nerve to the corresponding tentacle. The ganglion-globules were lined with a reddish-coloured pigment, deposited round the vesicular nuclei, and when twigs are given off from the smaller nerves, both the homogeneous neurilemma and the contained nervous matter break up like a dividing vessel, without preserving the individuality of distinct nerve tubes.

The sexes are combined in *Phyllirrhoë*, the male and female generative openings lying close together on the right side of the body in the inferior gastero-hepatic space, and before the anal aperture. The ovaries lie in the inferior recto-hepatic space, varying in number from two to five, in general. They are dark-coloured, subrotund, and finely lobulated bodies, from the fore part of each of which a very delicate duct arises, and all the ducts unite to form a single tube, with a trifling increase in its diameter. This common oviduct, lined by a pavement of transparent epithelial cells, passes forwards beneath the stomach in a flexuous manner; and in the inferior gastero-hepatic space, it first unites with the duct of the testis and again continues its devious course until it ends in the fundus of a much larger tube, whose lining membrane is armed with numerous conical and tooth-like processes, and to this is appended a long cæcal process much resembling the spermatheca of *Helix* for example. The external orifice of the male generative apparatus lies immediately posterior to that of the female organs. The testis is rather

small, subglobular in form, and closely connected with a short twisted tube*, much dilated at the middle part, and coated over with a layer of dark pigment cells. It is with this tube, as above noticed, the small oviduct communicates, in order, as it would seem, to permit of self-impregnation, or to answer some other purpose, with the nature of which we are unacquainted; but there is also an intromittent organ, which, however, I have never seen properly exserted.

As to the affinities of *Phyllirrhoë* with Gasteropods, it may be observed that the animal is bisexual, that the eyes, like those of *Glaucus* and *Ianthina*, are very small and rudimentary, being closely applied to the ganglia of the brain, after the manner of the acoustic sacs, and that both *Phyllirrhoë* and *Glaucus* agree in possessing two lateral horny jaws, articulated with each other superiorly, and bordered with minute conical teeth.

In the *Glaucidæ*, the branchiæ, which consist of simple papillary projections of the skin, are distributed in an equable manner over the dorsal region of the body; and any deviation from this arrangement would naturally tend, either to a more definite localization, or still further dispersion. It is the latter modification which appears to have taken place in *Phyllirrhoë*; so that its respiratory vessels ramify minutely through the common integument, just as the vascular trunks analogous to those which break up in the pectinate gill, adapted for aquatic breathing, are subdivided, and spread themselves over the smooth walls of the lung-chamber in Pulmonifera.

As respects its affinity to the Pteropods, here too the lateral jaws of *Phyllirrhoë* must be borne in mind, together with the almost complete suppression of the organs of vision. It is worthy of note also, that its acoustic capsules contain otokonia, as in Pteropoda, instead of single globular otolithes like those of *Glaucus*, and there is some reason to believe that the long tentacula, so called, are the homologues of the cephalic fins of Pteropods.

The particular features of *Phyllirrhoë*, expressed in the last paragraph, also serve to distinguish it from the Heteropoda, but it somewhat approximates this order in the general conformation of its body, which is elongated, laterally compressed, and presents a kind of proboscis at the anterior, and a rudder-fin at the posterior extremity. There is also, as it would appear to be, a small remnant of the foot

* I have distinctly traced the homologue of this tube in *Pteropoda*, *Heteropoda*, and the *Gasteropoda* proper.

on the inferior thin margin of the body, and the lateral undulatory motion of the animal in the water exactly resembles that of *Cerophora*, or *Carinaria*.

The heart of *Phyllirrhoë*, in common with that of Heteropods in general, holds a dorsal position. The auricle lies posterior to the ventricle, as in *Cerophora* and *Firola*, but the reverse is the case in *Atlanta* and *Carinaria*, the difference being due to the relation which the respiratory surface bears to the heart itself, lying in every case on the auricular side. Moreover it is remarkable that the rectum is directed backwards in the former instances, but turns forwards in the latter, taking an opposite course to that of the circulation through the heart.

It may be observed in conclusion, that in Heteropoda the viscera are closely packed together so as to occupy the smallest possible space, while they are widely distributed through the abdomen in *Phyllirrhoë*; thus, again, calling to mind its relationship to the Pteropoda.

This paper is illustrated with drawings representing the animal described and some of the details of its internal structure.

IV. "Brief sketch of the Anatomy of a new genus of pelagic Gasteropoda, named *Jasonilla*." By JOHN DENIS MACDONALD, Esq., R.N. Communicated by Sir W. BURNETT, K.C.B. Received March 30, 1855.

This communication refers to a remarkable genus of pelagic Gasteropoda, characterized, like *Macgillivraya* and *Cheletropis*, by the presence of ciliated cephalic appendages, but having, as in the present instance, a beautifully transparent, cartilaginous and perfectly symmetrical shell. The author has seen but one species, which was frequently taken between Port Jackson and the Isle of Pines.

The shell resembles that of *Argonauta* in shape, is less than one-eighth of an inch in diameter, and the little animal, when fully retracted, occupies but a small portion of its cavity. The margin of the mantle is of considerable thickness, containing loosely-packed cells, similar to those of the middle or operculigerous lobe of many Pteropods. About eight ciliated arms, identical in character with those of *Macgillivraya*, &c., encircle the head, including the mouth, which